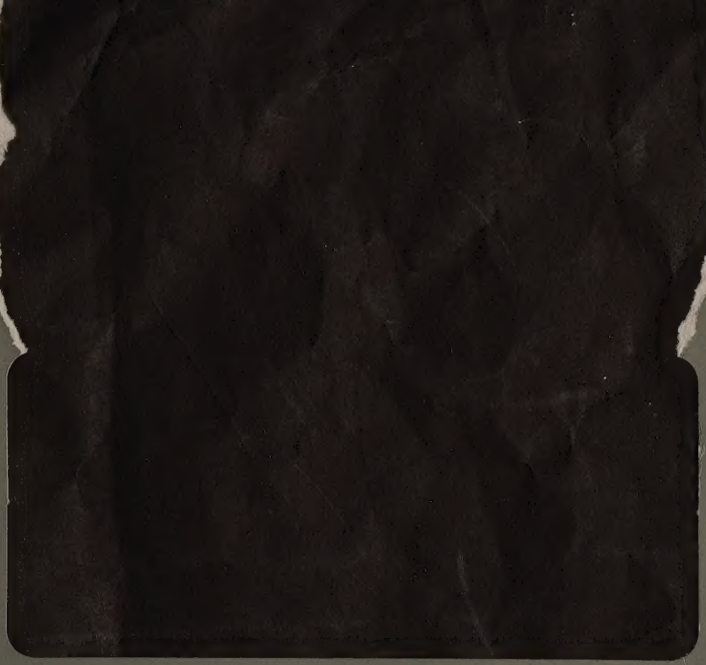

LeCroy

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Attention

The files on this disk must be compiled using the version of 7200 system software that it is to be used on. To do this follow the following procedure:

1. Insert floppy disk into mainframe.
2. Press **Modify - Learn Program** (if learn program is not present, press **EZ-MENU OFF**)
3. Select the files one at a time using the RECALL FILE box and press the RECALL button. This will force the system to compile the program.
4. Repeat this procedure for all files on the disk.

After this procedure has been completed press **MODIFY - LEARN PROGRAM**. Select the file called **NIST**, press **RECALL**, **RETURN** and then **RUN NIST**.

7234 / 7242 Series Calibration Manual

These test procedures are provided for the purpose of verifying the proper operation and basic specifications of the LeCroy 7200 series of mainframes and plugins. Performing these tests with traceable calibration standards is sufficient criteria for NIST certification.

These tests will test a 7242 series or 7234 module in a 7200 series mainframe. The calibration data may be logged to either a printer, a floppy or entered on the sample data sheets found at the end of this document..

Equipment Requirement List

7200 with software revision 1.5.0 or later
7200A with software revision 3.0.0 or later
NIST Calibration ICL program disk: PN 7200-NIST-DISK

Sinewave generator:
Marconi 2019A SG503 or SG504
(or equivalent) 3320B / 8640B

Square Wave Generator:
LeCroy 9210/ 9211 or 9214
Tektronix PG503 PG502 WILL DO
(or equivalent, with < 1nsec risetime)

Precision DC power Supply:
Datel DVC8500 5101B OR DAYTRON
Tektronix PS5004
(or Equivalent)

Power Meter:
HP 437B Power Meter
HP 8482A Head

ASSET/CONTROL NUMBER	MANUFACTURER	MODEL NUMBER
5-10093	DATRON	4808 /FLK5500
5-12103	FLUKE	8840A
11-2292	TEKTRONIX	SG503
11-2294	TEKTRONIX	TG501
5-2318	TEKTRONIX	PG502
5-4054	HEWLETT PACK	3320B
5-12096	HEWLETT PACK	3400A
5-4448	TEKTRONIX	SG504

Setup

Place the 7242/A/B or 7234 under test into a 7200 series mainframe.

Execute default settings on the mainframe.

Load and Run ICL program "NIST" located on "7200 NIST DATA" disk.

If more than one module is found in the mainframe, a menu will be displayed as in Fig 2.1. The user will then select which module is to be tested.

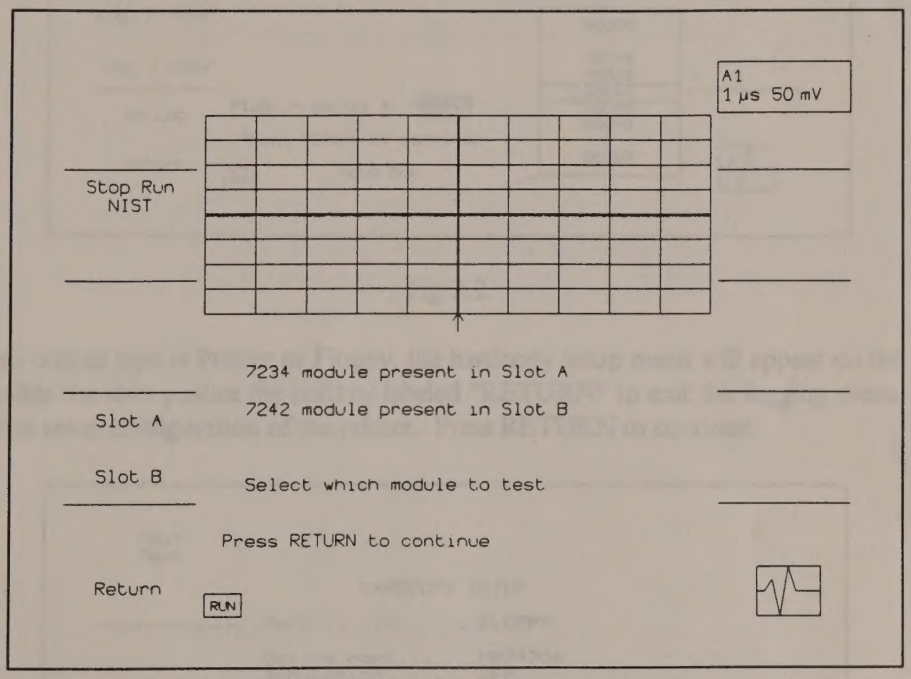

Fig 2.1

Next the LOGGING MENU will be displayed as in Fig 2.2.
Enter the serial number of the module by turning the inner cursor move knob. You will have the following choices of output type.

1) LOG TO PRINTER

2) LOG TO FLOPPY - Saves data to 3.5" floppy drive.The filename will be the serial number of the module under test (i.e. A96123.HCP).

3) NO LOG - Test results to screen only, the forms at the end of this document may be used as a data sheet.

Select the output type (default is NO LOG)

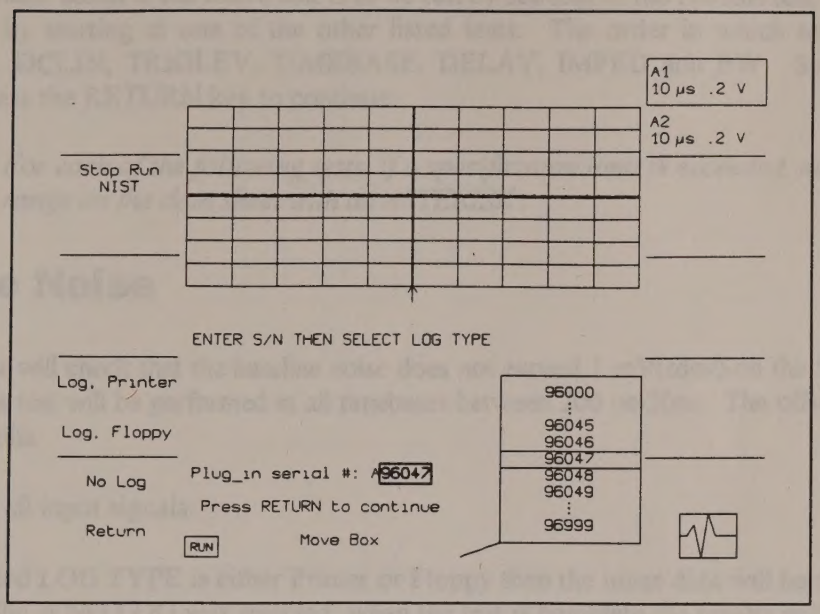

Fig 2.2

If the selected output type is Printer or Floppy, the hardcopy setup menu will appear on the screen (as in Fig 2.3) after the user pushes the softkey labeled "RETURN" to exit the logging menu. Here the user selects the setup configuration of the printer. Press RETURN to continue.

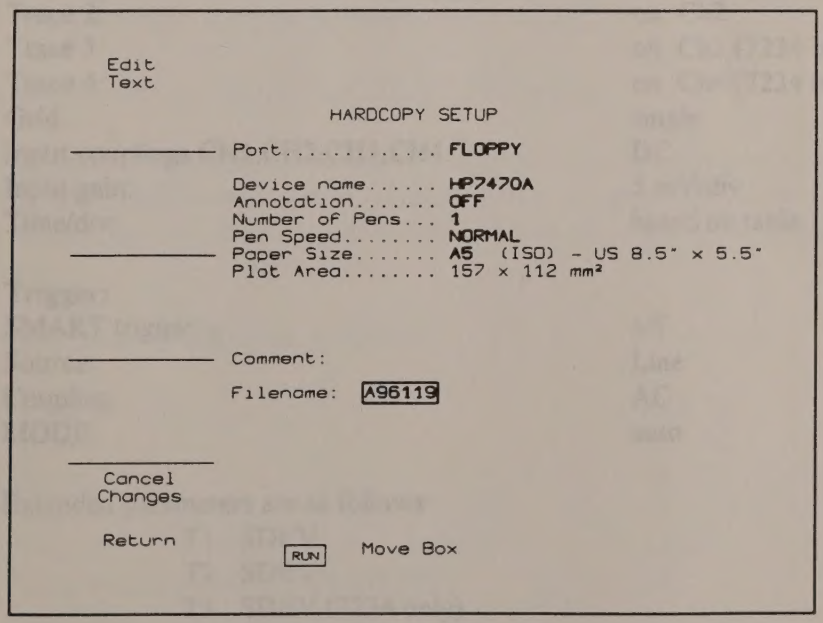

Fig 2.3

Next the user must select if the entire test is to be run by starting at the NOISE test or if tests are to be skipped by starting at one of the other listed tests. The order in which tests are run is NOISE, ADC, DCLIN, TRIGLEV, TIMEBASE, DELAY, IMPED and BW. Select from the choices and press the RETURN key to continue.

NOTE: *For each of the following tests, if a specification limit is exceeded, mark the failed range on the data sheet with an ASTERISK .*

BaseLine Noise

The NOISE test will check that the baseline noise does not exceed 1 mV(sdev) on the 5mV range on all channels.This test will be performed at all timebases between 200 us-20ns. The offset voltage will be set to zero volts.

- Disconnect all input signals.

- If the selected LOG TYPE is either Printer or Floppy then the noise data will be collected automatically. If NO LOG was selected, when the test is complete the results will be displayed on the screen as in Fig 2.4. Record these results in table 2.1. Follow the displayed instructions.

The module controls will be set as follows:

Trace 1:	on :Ch1
Trace 2:	on :Ch2
Trace 3:	on :Ch3 (7234 only)
Trace 4:	on :Ch4 (7234 only)
Grid:	single
Input couplings CH1,CH2,CH3,CH4:	DC
Input gain:	5 mV/div
Time/div:	based on table
Trigger:	
SMART trigger:	off
Source:	Line
Coupling:	AC
MODE:	auto

Extended parameters are as follows:

T1 : SDEV
T2 : SDEV
T3 : SDEV (7234 only)
T4 : SDEV (7234 only)

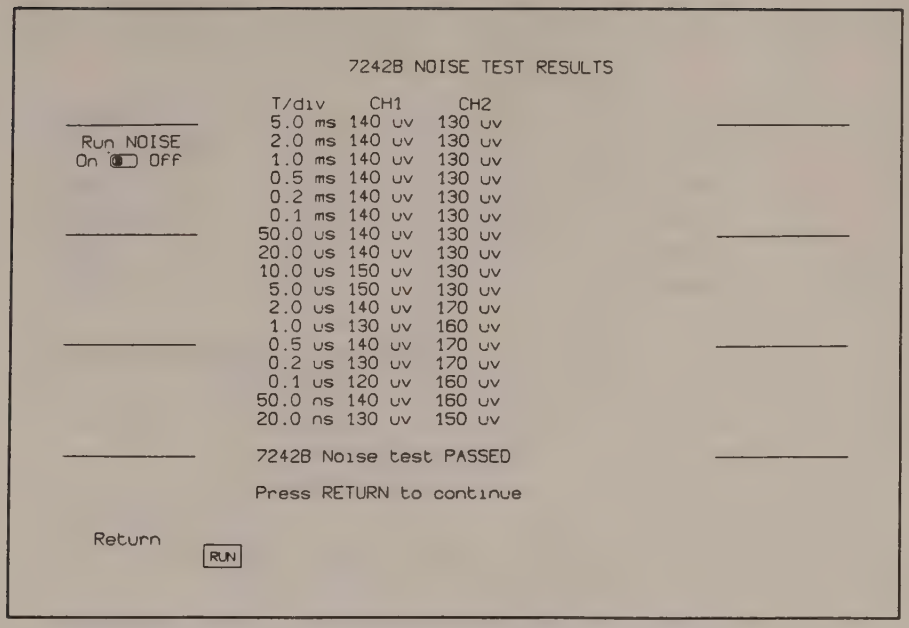
7242B NOISE TEST RESULTS
T/div CH1 CH2
5.0 ms 140 uv 130 uv
2.0 ms 140 uv 130 uv
1.0 ms 140 uv 130 uv
0.5 ms 140 uv 130 uv
0.2 ms 140 uv 130 uv
0.1 ms 140 uv 130 uv
50.0 us 140 uv 130 uv
20.0 us 140 uv 130 uv
10.0 us 150 uv 130 uv
5.0 us 150 uv 130 uv
2.0 us 140 uv 170 uv
1.0 us 130 uv 160 uv
0.5 us 140 uv 170 uv
0.2 us 130 uv 170 uv
0.1 us 120 uv 160 uv
50.0 ns 140 uv 160 uv
20.0 ns 130 uv 150 uv
7242B Noise test PASSED
Press RETURN to continue
Run NOISE
On Off
Return
RUN

Fig 2.4

ADC Codes Test

The ADC test will check that as the offset voltage is ramped from -3.5 divisions to +3.5 divisions, that the baseline sdev does not exceed 1 mV(sdev) on the 5mV range on all channels. This test will be performed at 1 ns/pt., 2.5 ns/pt. and 5 ns/pt (5ns/pt only on 7234).

- Connect 50Ω terminators to CH1, CH2, CH3, and CH4 inputs.

- If the selected LOG TYPE is either Printer or Floppy then the adc test data will be collected automatically. If NO LOG was selected, when the test is complete the results will be displayed on the screen as in Fig 2.5. Record these results in Table 2.2. Follow the displayed instructions.

The module controls will be set as follows:

Trace 1:	on :Ch1
Trace 2:	on :Ch2
Trace 3:	on :Ch3 (7234 only)
Trace 4:	on :Ch4 (7234 only)
Grid:	single
Input couplings CH1,CH2,CH3,CH4:	DC
Input gain:	5 mV/div
Time/div:	2,5,10 usec (2 us 7234)

Trigger:

SMART trigger:	off
Source:	Line
Coupling:	AC
Level :	zero
MODE:	auto

Extended parameters are as follows:

T1 : SDEV
T2 : SDEV
T3 : SDEV (7234 only)
T4 : SDEV (7234 only)

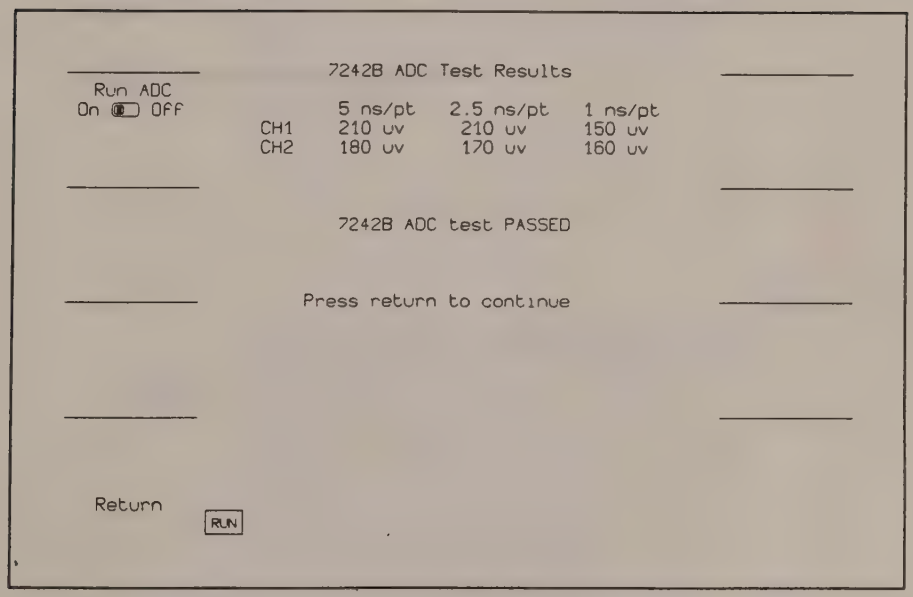

Fig 2.5

DC Gain and Linearity

The DC gain and linearity test will check that the DC accuracy of the module is within 2%. The report generated by the test will display the percent error for each channel and each volts per division setting.

- Connect a precision DC supply, set to 0 v to the channel 1 input. If the selected LOG TYPE is either Printer or Floppy then the DC gain and linearity test data will be collected

automatically. If NO LOG was selected, when the test is complete the results will be displayed on the screen as in Fig 2.6. Record these results in Table 2.3. Follow the displayed instructions.

- Press RETURN

The module controls will be set as follows:

Trace 1:	on
Grid:	single
Input couplings: Channel under test:	50 ohms DC
Input gain:	5mv/div
Time/div:	0.5ms
Trigger:	
SMART trigger:	off
Source:	Line

Extended parameters are as follows:
T1 : MEAN

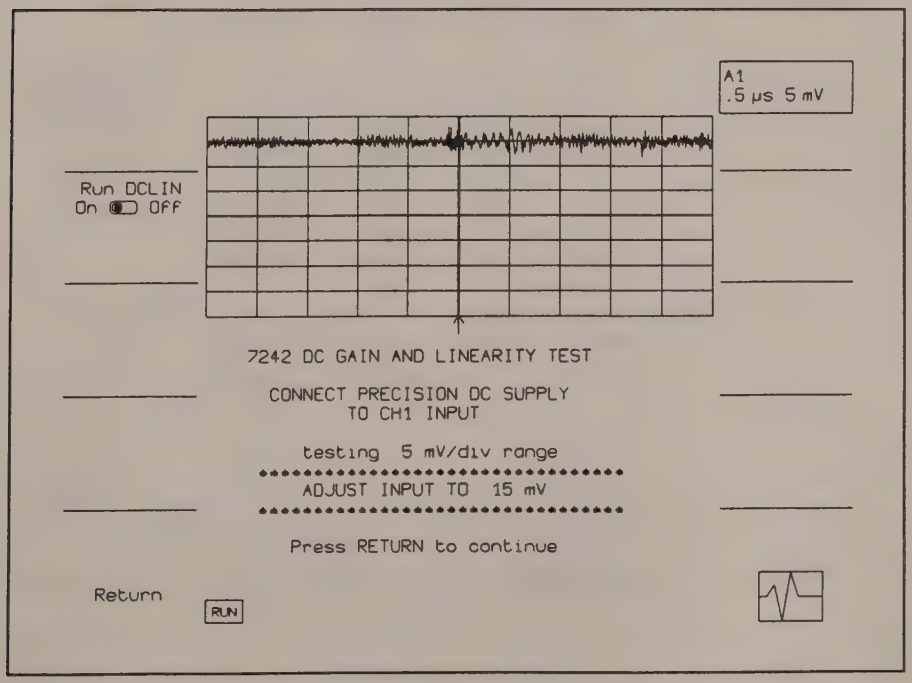

Fig 2.6

- Adjust input to 15mv
- Press RETURN

The 7200 will calculate the average mean value for 100 sweeps of 2000 points each (200,000 points). A menu as in Figure 2.6 will be displayed after each step of the test. The menu will display what voltage range is to be tested next and what voltage and polarity to adjust the DC supply to.

- Adjust the DC supply to the voltage indicated in the menu on the display.
- Press RETURN
- Repeat the above 2 steps until the message in Figure 2.7 is displayed.
- Move the DC supply output to the next channel indicated
- Press RETURN to continue
- Repeat the above 5 steps until a PASS or FAIL message is displayed on the screen.

Pressing RETURN will end the test. If NO LOG was selected, when the test is complete the results will be displayed on the screen as in Fig 2.7. Record these results in table 2.3.

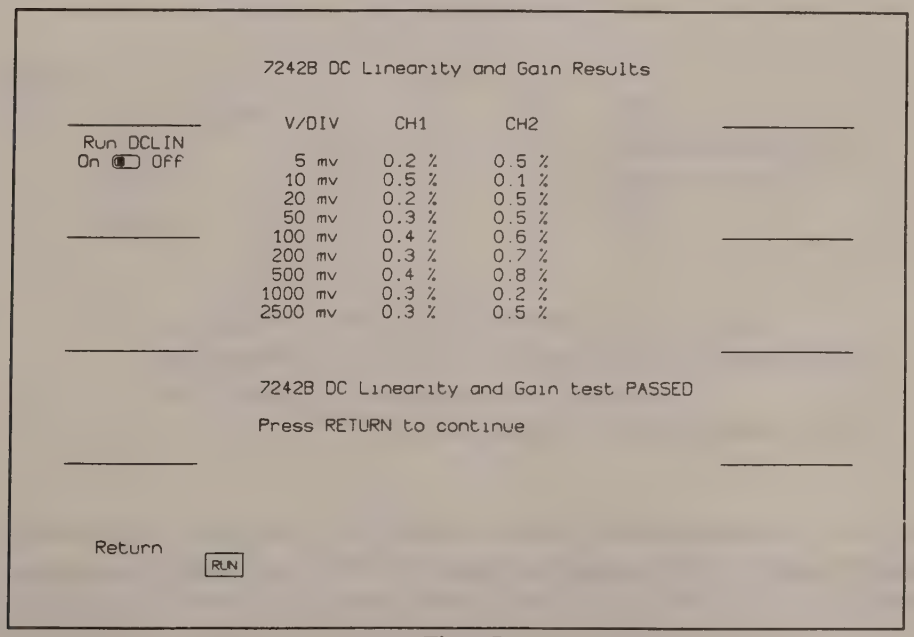
7242B DC Linearity and Gain Results
V/DIV CH1 CH2
Run DCLIN
On Off
5 mv 0.2 % 0.5 %
10 mv 0.5 % 0.1 %
20 mv 0.2 % 0.5 %
50 mv 0.3 % 0.5 %
100 mv 0.4 % 0.6 %
200 mv 0.3 % 0.7 %
500 mv 0.4 % 0.8 %
1000 mv 0.3 % 0.2 %
2500 mv 0.3 % 0.5 %
7242B DC Linearity and Gain test PASSED
Press RETURN to continue
Return
RUN

Fig 2.7

Trigger Level Accuracy

The trigger level accuracy test will check that the voltage level of the input signal is within 5% of the range of the trigger level setting, 10% for external trigger. If the selected LOG TYPE is either Printer or Floppy then the trigger accuracy data will be collected automatically. If NO LOG was selected, when the test is complete the results will be displayed on the screen as in Fig 2.8. Record these results in Table 2.4. Follow the displayed instructions.

- Connect a 10 Khz, 550 mv rms sine wave to the channel 1 input.
- Press RETURN

The module controls will be set as follows:

Trace 1:	on
Grid:	single
Input couplings: Channel under test:	50 ohms DC
Input gain:	100mV/div
Time/div:	20 us

Trigger:

SMART trigger:	off
Source:	Channel under test
Level:	Based on table
Coupling:	DC

RANGE = +/- 5*(v/div) = +/- 5*100mV = +/- 500mv
RESOLUTION = 0.025% of range = 0.00025 * 500mv = 125uV
ACCURACY = +/- 5% of range = +/- 25mv
+/- 10% of range = +/- 50 mv (external input)

If any range was found to be out of the specified accuracy, the measurement will be preceded and followed by asterisks. When the test of CH1 is complete a message will be displayed directing the user the move the input signal to the next channel. Both positive and negative slope trigger will be tested for all trigger inputs. Results outside these limits will be marked failed on the test results.

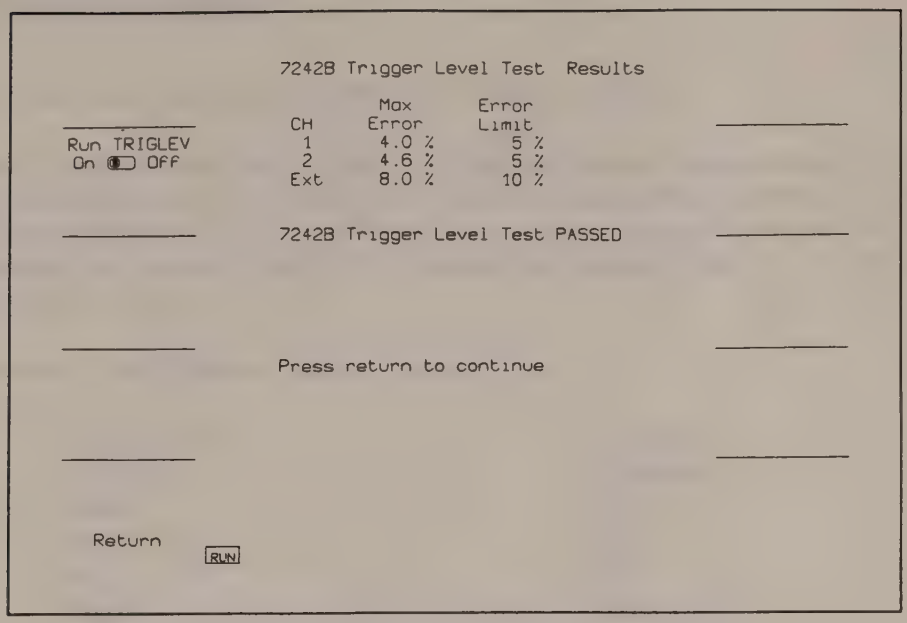

Fig 2.8

- Move the sine wave generator output to the input of the next channel indicated.
- Press RETURN to continue
- Repeat the above 2 steps until a PASS or FAIL message is displayed on the screen.
- If NO LOG was selected, the results will be displayed on the screen. Record these results in table 2.4.

Timebase Accuracy

This test will verify that the timebase is within 0.001% of its stated value.

- In order to verify the time base, use a sine wave generator with a frequency accuracy of better than 1 PPM. If the selected LOG TYPE is either Printer or Floppy then the timebase test data will be collected automatically. If NO LOG was selected, when the test is complete the results will be displayed on the screen as in Fig 2.9. Record these results in Table 2.6. Follow the displayed instructions.

The Panel setting for the Timebase Accuracy Test is:

Input Coupling:	50 Ω DC
Input Gain:	200mv/div
Offset:	ZERO
Time / Div:	0.1 S
RIS:	OFF
Trigger:	Line

Extended Parameters are:
T1: freq

- Connect sine wave generator to CH1 input
- Adjust input frequency to 10 MHz
- Adjust input amplitude to 6 divisions (approx. 225 mv rms)
- Check that T1:freq<100Hz
- The frequency being displayed is the difference (or aliased) frequency between the input signal and the modules sample clock. The test limit is 100Hz (or .001%).
- Record T1:freq on the test results data sheet

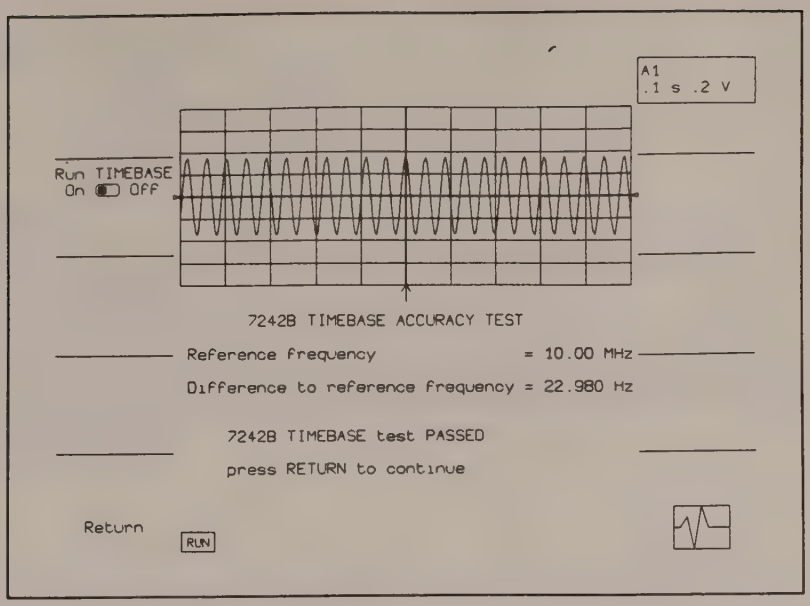

Fig 2.9

Trigger Delay & Front End Test

This test will verify that the trigger point is within 1 nsec of the trigger delay setting. It will also check the overshoot of the input amplifier is less than 10%.

- Connect a 10 Khz, 700 mv p-p square wave with a rise time of less than 1 ns to the channel 1 input. If the selected LOG TYPE is either Printer or Floppy then the trigger delay data will be collected automatically. If NO LOG was selected, when the test is complete the results will be displayed on the screen as in Fig 2.10. Record these results in Table 2.6. Follow the displayed instructions.

The module controls will be set as follows:

Trace 1:	on
Input couplings CH1 and CH2:	50 Ω DC
Input gain:	200mV/div
Time/div:	2ns
Trigger:	
SMART trigger:	off
Source:	Channel under test
Level:	Based on table
Coupling:	DC

Extended parameters are as follows:

T1:tafl	T1:tars
T1:ampl	T1:freq
T1:ovsp	T1:ovsn

- Press RETURN
- When the test of CH1 is complete a message will be displayed directing the user to move the input signal to the next channel.
- Press RETURN to continue
- Repeat the above 2 steps until a PASS or FAIL message is displayed on the screen.
- If NO LOG was selected the results will be displayed on the screen as in Fig 2.10. Record these results in table 2.6.

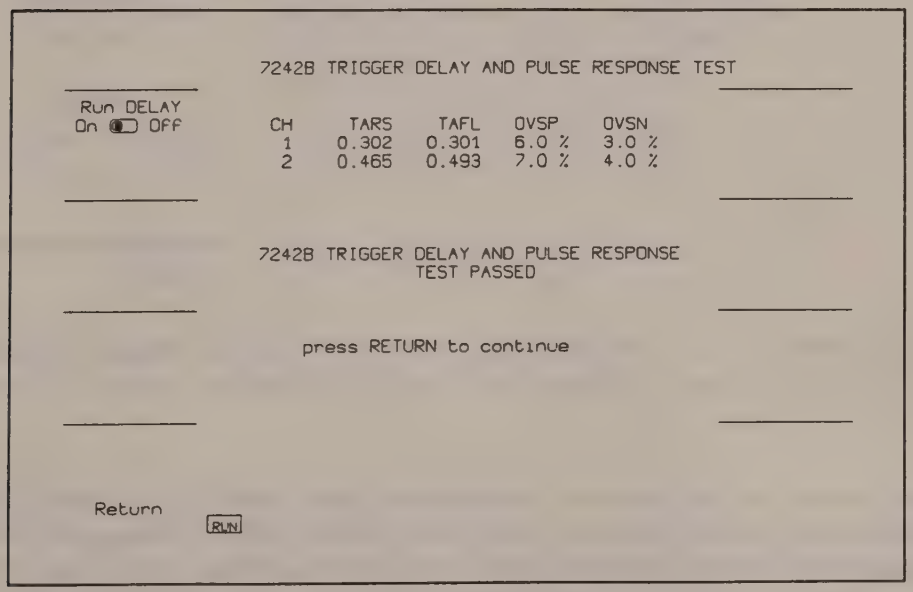
7242B TRIGGER DELAY AND PULSE RESPONSE TEST
Run DELAY
On OFF
CH TARS TAFL OVSP OVSN
1 0.302 0.301 6.0 % 3.0 %
2 0.465 0.493 7.0 % 4.0 %
7242B TRIGGER DELAY AND PULSE RESPONSE TEST PASSED
press RETURN to continue
Return
RUN

Fig 2.10

Bandwidth

This test will verify that the bandwidth is greater than 400 MHz for a 7242 and 500 MHz for a 7242A, 7242B and 7234. It will also check the flatness of the frequency response.

- Connect a leveled sine wave generator to the channel 1 input*. If the selected LOG TYPE is either Printer or Floppy then the bandwidth data will be collected automatically. If NO LOG was selected, when the test is complete the results will be displayed on the screen as in Fig 2.11. Record these results in Table 2.7. Follow the displayed instructions.

  The module controls will be set as follows:

Trace 1:	on
Grid:	single
Input couplings CH1 and CH2:	50 Ω DC
Input gain:	50mV/div
Time/div:	2.5 us
Trigger:	
SMART trigger:	off
Source:	Line

Extended parameters are as follows:

T1:rms

- Adjust amplitude of generator to 100 mv rms * correction factor. (If no correction factor is available use 1.0, however unit may fail BW test if loss in cable is to great or generator output is not flat.

---

* To verify the flatness of the generator and cable, measure the loss of the cable used to measure the bandwidth of the system. Apply a 2MHz -7.1db signal to the cable. Measure the amplitude at the output of the cable, with a calibrated power meter, press the relative button. Now change the frequency to 401 and 501MHz and measure the amplitude again, the display will read the difference. Calculate the correction factor as follows:

correction factor = 10E-Difference/20

For example, if the difference is -.3db then

correction factor = 10E.3/20 = 10E.015 = 1.035

Record this correction factor, the difference in db, and the serial number of the signal generator on a card attached to the cable.

- Press RETURN
- A message will be displayed directing the user to increase the input signal's frequency until the maximum frequency for that module is reached. The signal will be aliased when the frequency is greater than 101 MHz.
- When the test of CH1 is complete a message will be displayed directing the user to move the input signal to the next channel.
- Press RETURN to continue
- Repeat the above 2 steps until a PASS or FAIL message is displayed on the screen.
- If NO LOG was selected the results will be displayed on the screen as in Fig 2.10. Record these results in table 2.6.

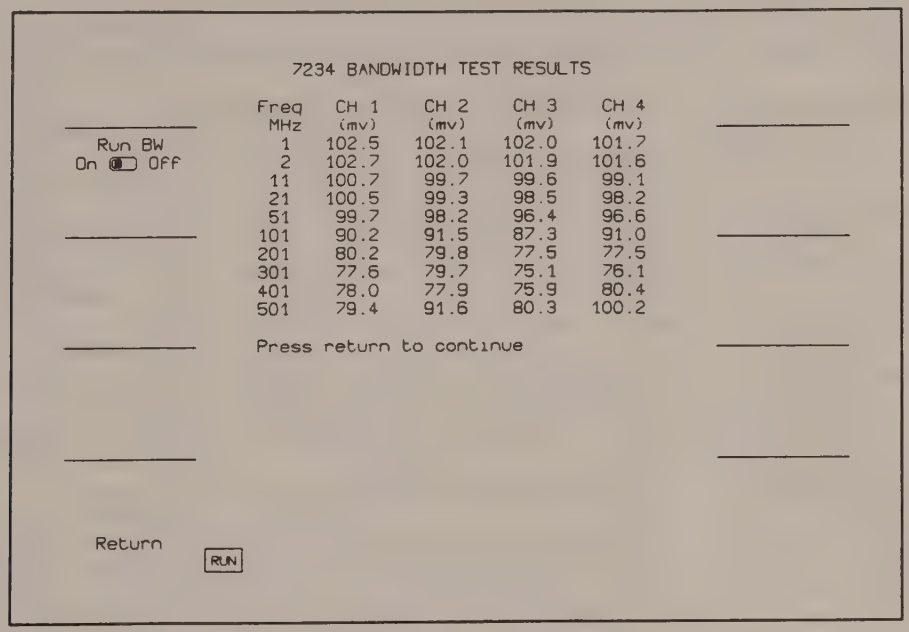

Fig 2.11

Input Impedance

- Using a DVM with accuracy better than 0.1 Ω :
- Connect DVM to BNC input of channel under test
- Check the input impedance for all gain ranges and input couplings listed in table 2.7 and record the measured impedance on the test results work sheet: (change gain range -1 by turning V/DIV knob)
- Change input coupling to DC 1 MΩ and repeat above tests

The limits for the 1 Meg ohm input impedance test are between 980,000 ohms and 1,020,000 ohms, the limits for 50 ohm input impedance are 49 ohms and 51 ohms.

DATA SHEET : Baseline Noise

V/div	Time/div	CH 1 (limit 1.0 mV)	CH 2 (limit 1.0 mV)	CH 3 (limit 1.0 mV)	CH 4 (limit 1.0 mV)
5 mV	5 msec				
	2 msec				
	1 msec				
	0.5 msec				
	0.2 msec				
	0.1 msec				
	50 usec				
	20 usec				
	10 usec				
	5 usec				
	2 usec				
	1 usec				
	0.5 usec				
	0.2 usec				
	0.1 usec				
	50 nsec				
	20 nsec				

Mainframe Serial Number	Plug-in Serial Number	TEST DATE	PERFORMED BY

Table 2.1

DATA SHEET : ADC CODES test

V/div	Channel	5 ns/pt	2.5 ns/pt	1 ns/pt
5 mV	1			
	2			
	3			
	4			

Mainframe Serial Number	Plug-in Serial Number	TEST DATE	PERFORMED BY

Table 2.2

DATA SHEET : DC Gain and Linearity

Limit < 2% error

V/div	DC Input	CH1	CH2	CH3	CH4
5 mV	±15 mV				
10 mv	±30 mV				
20 mv	±60 mV				
50 mv	±150 mv				
100 mv	±300 mv				
200 mv	±600 mv				
500 mv	±1500 mv				
1 v	±1500 mv				
2.5 v	±1500 mv				

Mainframe Serial Number	Plug-in Serial Number	**TEST DATE**	**PERFORMED BY**

Equipment Used : Mfg, Model Number	Calibration Information

Table 2.3

DATA SHEET : Trigger Level Accuracy

Channel	Max Error	Error Limit
1		5 %
2		5 %
3		5 %
Ext		10 %

Mainframe Serial Number	Plug-in Serial Number	TEST DATE	PERFORMED BY

Equipment Used : Mfg, Model Number	Calibration Information

Table 2.4

DATA SHEET : Timebase

	CH1 (Hz)
FREQ (limit < 100)	

Mainframe Serial Number	Plug-in Serial Number	**TEST DATE**	**PERFORMED BY**

Equipment Used : Mfg, Model Number	Calibration Information

Table 2.5

DATA SHEET : Trigger Delay and Pulse Response

	CH 1	CH 2	CH 3	CH 4
TARS (limit < 1 ns)				
TAFL (limit < 1 ns)				
OVSP (limit < 10 %)				
OVSN (limit < 10 %)				

Mainframe Serial Number	Plug-in Serial Number	**TEST DATE**	**PERFORMED BY**

Equipment Used : Mfg, Model Number	Calibration Information

Table 2.6

DATA SHEET : Bandwidth

Test assumes flat response from generator and no losses in cable from generator to input of module unless correction factor is used. Check box below and indicate correction factor if correction factor is being used. Input signal amplitude is 100 mv rms * correction factor

☐ Correction factor used to adjust input signal amplitude_____.

Input Freq. (MHz)	CH 1 (mv rms)	CH 2 (mv rms)	CH 3 (mv rms)	CH 4 (mv rms)	Limit (mv rms) 7242 only	Limit (mv rms) 7242A/B 7234
6					≥ 100	≥ 100
251					≥ 74	≥ 74
301					≥ 72	≥ 74
401					≥ 70.7	≥ 72
501					N/A	≥ 70.7

Mainframe Serial Number	Plug-in Serial Number	**TEST DATE**	**PERFORMED BY**

Equipment Used : Mfg, Model Number	Calibration Information

Table 2.7

DATA SHEET : Input Impedance

	Input Coupling	CH 1	CH 2	CH 3	CH 4	Limit
5 mv	50 Ω					49 - 51 Ω
10 mv	50 Ω					
20 mv	50 Ω					
50 mv	50 Ω					
100 mv	50 Ω					
200 mv	50 Ω					
500 mv	50 Ω					
1 v	50 Ω					
5 mv	DC 1 MΩ					980 K - 1.02 MΩ
10 mv	DC 1 MΩ					
20 mv	DC 1 MΩ					
50 mv	DC 1 MΩ					
100 mv	DC 1 MΩ					
200 mv	DC 1 MΩ					
500 mv	DC 1 MΩ					
1 v	DC 1 MΩ					

Mainframe Serial Number	Plug-in Serial Number	**TEST DATE**	**PERFORMED BY**

Equipment Used : Mfg, Model Number	Calibration Information

Table 2.8

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